

REMARKS

Re-examination is respectfully requested in light of the foregoing amendments.

These remarks follow the order of the detailed Office Action beginning at page 2 thereof.

Drawings

Applicant appreciates the approval of the drawings.

Claim Objections

Applicant has amended the claims to provide proper antecedent basis in each of the claims which is the subject of the various claim objections. Still further, Applicant has amended the claims to state that this is a known good die. The term "known good die" is now used in place of "integrated circuit" or "integrated circuit device".

Next, Applicant in these amendments has as noted above claimed a known good die. For this reason, claim 9 has been canceled.

Applicant has attempted to be consistent in the use of the term "solder ball array connections" and "wire bond pad connections" as the Examiner has required.

The suggested amendment in claim 8 has been amended by inserting the language suggested by the Examiner.

Claim Rejections - 35 USC § 112

Claims 2 and 8 have been rejected under 35 USC § 112 second paragraph as being indefinite because there is insufficient antecedent basis for the limitation "stress tolerant". Applicant, however, has provided in this specification very specific teachings

of stress tolerant technology. First, the Examiner should note that since stress tolerant solder ball or C4 connections are known in the art, it is not necessary to re-teach this art again in this specification. Stress tolerance for technology is discussed and taught at page 5, beginning at line 19 and continuing through line 24. Next, stress tolerant technology is further discussed at page 6, line 21 through line 25 where Applicant teaches that the location of the joints should be closed to the center of the chip. Further, stress tolerance is again discussed at page 7, lines 7 - 10 with the difference between stress tolerant and non-stress tolerant technologies are set forth with respect to the prior art. At page 8, beginning at line 7 and continuing through line 10, Applicant discloses that stress tolerance is feature of C4 technology which is continuously referred to in the specification. At page 10, lines 3 - 6, and lines 10 - 20, Applicant further teaches the use of metallurgical connections as stress tolerant. Applicant in Figure 1, as described at page 14 beginning at line 9 and continuing through line 16, discloses that Figure 1 is an example of a stress tolerant ball array. At page 14, beginning at line 22, Applicant further discusses stress tolerance, and continuing up through page 15, line 14. At page 15, lines 10 - 14, Applicant respectfully submits that stress tolerance is clearly well known. Still further, Applicant has cited other well known stress tolerant information from the art at page 15, beginning at line 14 and continuing through line 25 which are US publications and are incorporated into the specification. Still further,

Applicant has shown actual photographs of stress tolerant configurations which are Figures 4 and 5 as discussed at page 16, lines 2 through 5. Figures 4 and 5 are also cited as examples of stress tolerant design and discussed at page 18, lines 10 - 15. At page 19, heavily leaded solder balls which are uniquely useful for C4 and stress tolerance is disclosed.

At the bottom of page 4 of the Office Action the Examiner states that there is no definitive qualitative criterion set forth by Applicant's disclosure that one of ordinary skill in the art to ascertain the scope and meaning of stress tolerant with regard to the bumps of BGA. Applicant respectfully submits that photographs (Figures 4 and 5) and the disclosures of patents as well as stress tolerant literature found at page 15 clearly prove that stress tolerance is well known in the art, and need not be repeated here.

The Examiner should also refer to Figures 4 and 5 which show the cluster of balls in the center, as well as additional balls pointing radially outward towards the wire bond pad connections. These radially outward pointing groups of balls are precisely the purpose of stress tolerance.

Claim Rejections - 35 USC § 102

Claims 1 - 6 and 8 - 9 were rejected under 35 USC § 102(b) as being anticipated by Takahashi '281. Applicant respectfully submits that claim 8 was clearly not anticipated by Takahashi as will be discussed herein below. Takahashi shows a chip (1) (the die) which has but one connection, which is electrode pad (2) referred to in the specification as the first electrode pad. On

top of the chip (die) is a substrate made of glass, fiber and epoxy with a bump arrangement. Glass, fiber and epoxy is well known not to comprise a die or chip. On top of the glass-fiber-epoxy arrangement are pewter bumps (23). Pewter bumps (23) are connected to a second electrode pad (22) by means of connections (24) within the substrate (21). The second wire bond connections (4) connect the pads (22) to the first electrode pad (2) of the die. Also, are wire bonds (3) which connect the first electrode pad to a third electrode pad (13). Surrounding the wires (4) and (3) is a closure layer which is not removed. The finished product comprises a chip which has no solder balls attached to it, wherein the chip has only a single wire bond connector which is referred to as the first electrode pad. In the text material (rough translation of '281), the last line thereof, it states "the chip with which it was proved before mounting that it is an excellent article chip, i.e., KGD (known good die)." This language clearly unequivocally states that the chip (1) is the known good die. Applicant has now claimed directly the known good die, and not an integrated circuit device as originally set forth. The known good die of '281 does not have solder balls, and does not teach anything about testing alternatively by use of wire bond connections or solder ball connections as Applicant sets forth in claim 1.

Claim 2

Claim 2 relates to the alternate use of solder ball connections or wire bond connections. This simply is not possible with the die of '281 which has no solder balls at all.

Claim 3

In '281, there is no disclosure of placement on the same side of the die and on the die as would be required by claim 3 when read as a whole.

Claim 4

In '281, even as construed by the Examiner, the balls (23) are not on the same level as electrode pads (2). Since electrode pads (22) are not on the die, Claim 4 would not be anticipated.

Claim 5

Allowing unused contacts to remain upon the die is simply not suggested by the '281 reference.

Claim 6

The teaching of metallurgical connections directly to the die both in the form of wire bond connections or solder ball connections is not suggested or taught by the art.

Claim 7

Claim 7 relates to C4 technology. Applicant concedes that C4 technology is known in the art, but not in the combination as set forth in claim 1 where it is used to provide an alternate test arrangement for known good die.

Claim 8

In claim 8, the solder ball array is set forth as being stress tolerant. This is of importance when the solder ball array is used with the end use device. This feature is simply not suggested by the '281 reference.

Claim 9

Claim 9 is canceled.

Claim 44


In claim 11 Applicant further states that the known good die after testing for known good die that the connections used for known good die testing are not useful when the die is placed in an end use device. This is clearly not suggested by '281 which would retain the pins (12) for testing even after pewter bumps (23) would be connected to an end use device.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version with Markings to Show Changes Made."

In view of the foregoing, it is respectfully submitted that the application is now in condition for allowance, and early action in accordance thereof is requested. In the event there is any reason why the application cannot be allowed in this current

condition, it is respectfully requested that the Examiner contact the undersigned at the number listed below to resolve any problems by Interview or Examiner's Amendment.

Respectfully submitted,


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Date: December 18, 2002

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VERSION WITH MARKINGS TO SHOW CHANGES MADEIn the Claims:

Claim 9 has been canceled.

Claims 1 - 8 and 10 have been amended as follows:

1. (Twice Amended) A known good [integrated circuit device] die (KGD) having optional solder ball array or wire bond connections[:];

solder ball array connections on [an integrated circuit device] the known good die surface;

an array of wire bond connections on the die electrically connected to the solder ball array connections;

wherein known good [integrated circuit device] die testing is completed prior to mounting the [integrated circuit device] known good die on an end use device by connecting a test device by wire bond connections or by solder ball connections; [and]

wherein when either the wire bond connections are used or the solder ball connections are used for known good [integrated circuit device] die testing, the other is available for connection to an end use device.

2. (Amended) The known good [integrated circuit device] die in accordance with claim 1, wherein when either the wire bond [pad]

connections or [the] stress tolerant solder ball connections is used to form a contact with the test device, the other is not affected by a known good die (KGD) test.

3. (Amended) The known good [integrated circuit device] die in accordance with claim 1, wherein the wire bond [pad] connections and the solder ball array [contacts] connections are on the same side of the [integrated circuit] die.

4. (Amended) The known good [integrated circuit device] die in accordance with claim 1, wherein the solder ball array connections and the wire bond [pads] connections are on the substantially the same level of the integrated circuit so that either may provide contact with an end use device.

5. (Amended) The known good [integrated circuit device] die in accordance with claim 1, wherein the solder ball array connections or wire bond [pads] connections which are used for testing are not removed from the [integrated circuit] die after testing.

6. (Amended) The known good [integrated circuit device] die in accordance with claim 1, wherein connections to the test device are metallurgical connections.

7. (Amended) The known good [integrated circuit device] die in accordance with claim 1, wherein the solder ball array connections are controlled collapse chip connections.

8. (Amended) The known good [integrated circuit device] die in accordance with claim 1, wherein the solder ball array forming the solder ball array connections is a stress tolerant solder ball array.

10. (Amended) The known good [integrated circuit device] die in accordance with claim 1 wherein the [integrated circuit device] known good die is connected to an end use device.

New claim 44 has been added above.